



Network  
Nature

# Deliverable 3.5. Report on practical, research and innovation needs

**WP3 Task 3.3**

EL Harrak Mariem & Lemaitre Frédéric - Biodiversa +

Versions:

21/10/21: Draft analysis and presentation at NetworkNature annual event

08/11/21: update of draft analysis and presentation at NetworkNature Strategic WS on EU R&I Roadmap for NBS

25/11/21: First draft report submitted for NetworkNature internal review

29/11/21: Second draft with updates from internal review

- *Context elements on WP3 in introduction*
- *Methodological clarifications/precisions incl. addition of Table 2*
- *Additional analysis comments including clarifications in open consultation and table 3 and on Fig. 4*

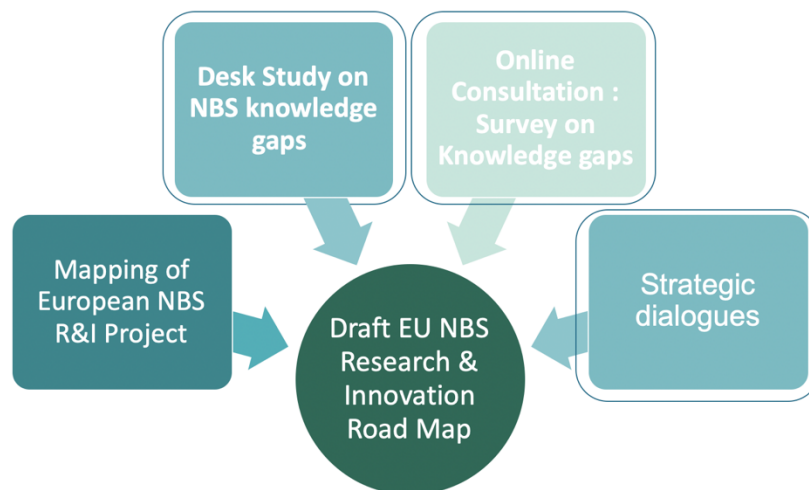
24/05/22: Update of the results after the publication of the online database

# TABLE OF Content

<b>1. Introduction</b> .....	<b>1</b>
<b>2. Methodology</b> .....	<b>2</b>
1. Desk Study: .....	2
2. Online Consultation: .....	4
3. Collaborative session: .....	4
<b>3. Analysis and results</b> .....	<b>5</b>
1. Desk Study.....	5
2. Open consultation results .....	6
3. Collaborative session results .....	8
<b>4. Next Steps</b> .....	<b>9</b>
Annex 1: List of publication used in the desk study .....	10
Annex 2: Societal Challenge Typology .....	12
Annex 3: detailed results of the dialogue session on knowledge gaps during the NetworkNature annual event 2021.....	13

# 1.Introduction

This report on practical, research and innovation needs was prepared in the context of NetworkNature Work Package 3. The aim was to compile an evidence base for Nature-based Solutions (NBS), to be used to support the uptake and proliferation of NBS in planning, strengthening the practical application and contributing to realizing sustainable communities. The task tackled by this report on the collection of needs for NBS knowledge (T3.3) will determine R&I, policy and practitioners knowledge and knowledge-implementation needs which will be used towards the re-development of the EU Roadmap on Research and Innovation for NBS (MS5.1 and D5.1). The process for the development of this roadmap is summarised in figure 1 below, and this report presents the main results from the three highlighted activities (namely desk study, survey and dialogue on knowledge gaps).



**Figure 1:** *process towards the development of a first draft of the EU roadmap for R&I on NBS*

In addition, the knowledge gaps collected and analysed in this report was published on NetworkNature in the form of a [knowledge gap database](#) for science, policy and practice (D3.2) in January 2022.

## 2. Methodology

This work intends to collect and analyse broad needs for Nature-based Solutions (NBS) knowledge and to construct an open-source database for science, policy and practice. The collection of knowledge gaps and needs was undertaken through three activities.

### 1. Desk Study:

The desk study started with the analysis of key European publications on Nature-based Solutions (known to regroup knowledge gaps and needs) from major EU large-scale Research and Innovation (R&I) initiatives such as the Nature-based solution State of the Art in EU-funded project or the Biodiversa+ Strategic Research and Innovation Agenda. These were identified through informal searches and expert consultations (e.g. with the NetworkNature partners and EC task force members). All suggestions were considered. The analysis of above-mentioned publications allowed the identification of knowledge gaps, as well as the further scoping of their bibliographies for other relevant knowledge sources.

To further the study, the search engines of Google Scholar, Science Direct, as well as Google for grey literature were used to research relevant publications. The search was made using the terms “knowledge gaps” and “Nature-based Solutions” (as well as various variations). Since the term Nature-based Solution is an umbrella term we also used the different terminology of approaches linked to NBS (Table 1).

**Table 1.** List of terms searched with “Knowledge gaps”

Agro-ecological approaches
Agroforestry
Ecological engineering
Ecological restoration
Ecosystem-based adaptation
Ecosystem-based disaster risk reduction
Ecosystem-based management
Ecosystem-based mitigation
Green and Blue Infrastructure
Nature-based solutions
NBS
Protected area

Nineteen publications were selected as relevant for the desk study (see Annex 1) and analysed for knowledge and implementation gaps on NBS. Gaps were identified only when clearly stated as such in the publication. Citations were gathered into a database to be analysed. From this, **142** unique citations were identified and then categorized into 27 broad gap topics (see Table 2).

**Tableau 2:** List of broad gap topics

Approaches and governance systems for implementation
Awareness and capacity building
Biodiversity benefits
Communication
Cost/benefit evaluations
Direct and indirect benefits for climate mitigation
Effectiveness across socio-ecological contexts
Effectiveness compared to conventional approaches
Effectiveness of hybrid solutions
Effectiveness at different geographical scales
Effectiveness at different time scales
Impacts for health and well-being
Knowledge base
Methodologies and tools for systematic evaluation
Monitoring tools
NBS interaction at the landscape scale
Negative impacts
Performance and characteristics of plants
Planning and policy frameworks
Protected area management
Relationship between biodiversity, ecosystem functions and ecosystem services
Risks from slow-onset events
Social cohesion and environmental justice
Stakeholder engagement
Synergies and trade-offs between goals
Technical references, design standards and guidelines
Valuation tools

The 27 broad gap topics were then analysed and classified according to:

- Broad themes and topics of gaps (i.e. NBS technical design, NBS capacity building, NBS implementation, NBS evaluation)

- Stage of implementation (i.e. co-implementation, co-governance, co-creation, co-design, co-monitoring)
- Relevant scale of the gaps (i.e. Local, Regional, Global)
- Societal challenge addressed (i.e. Climate Resilience, Climate and Natural Hazards, Food security, Water management, etc. typology derived from the EC and UICN typologies (seen Annex 4)

## **2. Online Consultation:**

To reach a broader audience, an online survey was used place to gather direct feedback from the NBS community. The consultation was opened from the 4th of September to the 15th of October 2021 on the NetworkNature website and was relayed via the European Commission NBS Task Forces, the NetworkNature members, the NetworkNature and Biodiversa+ social media and sent through different mailing lists. 45 individuals (see repartition in part 3.2) responded to the survey and identified 48 knowledge gaps, 29 of which were relevant to NBS. Similarly, to the desk study, these gaps were also organised into 14 broad topics as presented in the analysis of results (from the 27 broad topics used for the desk study).

## **3. Collaborative session:**

During the NetworkNature 2021 Annual Event on the 21st of October, a parallel session was organised titled “Closing the research gaps for Nature-based Solutions”. During this session, participants were asked to work collaboratively to identify levers and barriers for Research and Innovation to accelerate/facilitate the deployment of effective Nature-based Solutions. Twenty people participated and collaboratively identified the main barriers corresponding to knowledge gaps and needs.

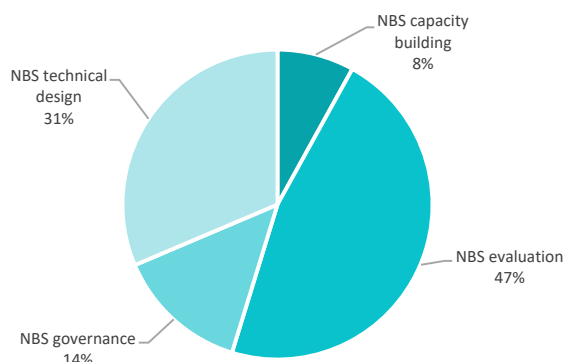
## 3. Analysis and results

### 1. Desk Study

The overall four broad themes for NBS knowledge gaps identified are:

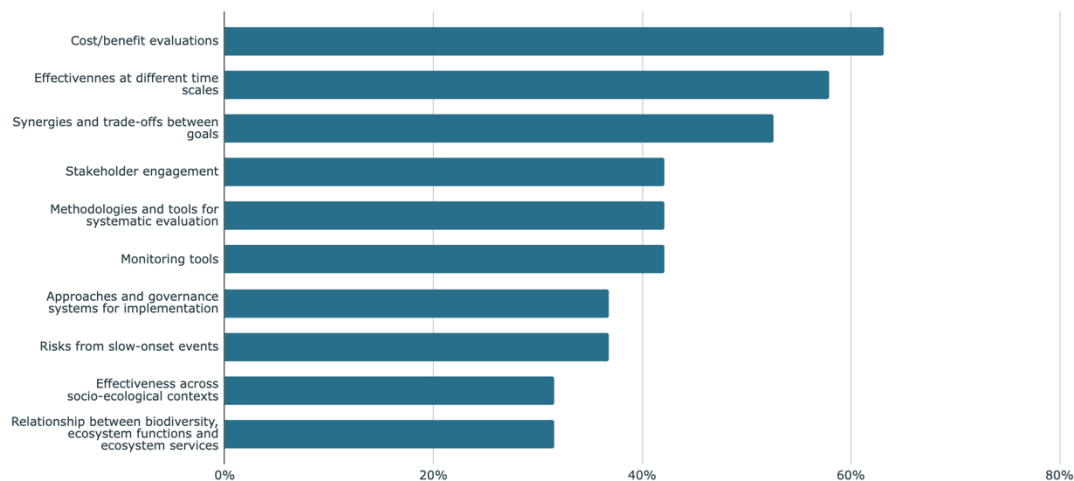
- NBS governance
- NBS technical design
- NBS capacity building
- NBS Evaluation

The desk study results show an overall strong coherence across key publications in the identification of gaps under the broad themes (see **Figure 2**).



**Figure 2.** Weight of broad themes in gaps through the desk study

Gaps relating to the evaluation of NBS costs and benefits were cited in over 60 % of analysed gaps (see **Figure 3**).



**Figure 3.** Percentage of publications citing gaps related to broad topics under the desk study.

Overall, **understanding and monitoring NBS benefits and impacts** was a highly recurrent element in the publications consulted, with the main recurrent gaps linking to issues around the **performance and evaluation of NBS over time and socio-ecological context**, or around the **development of tools and methodologies for systemic evaluation**.



Gaps relating to the technical design mainly relate to the [understanding of synergies and trade-offs between multiple goals of NBS](#), which are the third most cited, in 55% of analysed publications. Other topics under this theme relate to the need to [integrate risks of slow-onset events in NBS designs and also on the relationship between biodiversity, ecosystem functions and ecosystem services](#).

Finally, most cited gaps related to governance relate to the [development of appropriate approaches and governance models for NBS](#), from business/financial perspectives but also in terms of co-development and co-implementation of NBS with stakeholders, each occurring in close to 30-40% of publications consulted.

## 2. Open consultation results

Gaps collected in the online consultation were gathered in 14 broad topics as presented in Table 2 (From the 27 used in the desk study). These correspond to the 29 relevant answers submitted by respondents, which originate half from academia/higher education, and half from stakeholder organisations including international organisations (17%), private companies and SMEs (13%) and national and local policy makers or advisors (5%). The analysis of responses below gives a profile from this sample of responses only, and certainly do not intend to draw any broader conclusions. The sample studied contained several biases since most of the respondents were from a research background and because of the relative size of the responses.

The majority of gaps was identified as relating the category [NBS technical design \(48%\)](#), followed by [NBS Capacity building \(41%\)](#) and [NBS evaluation \(31%\)](#).

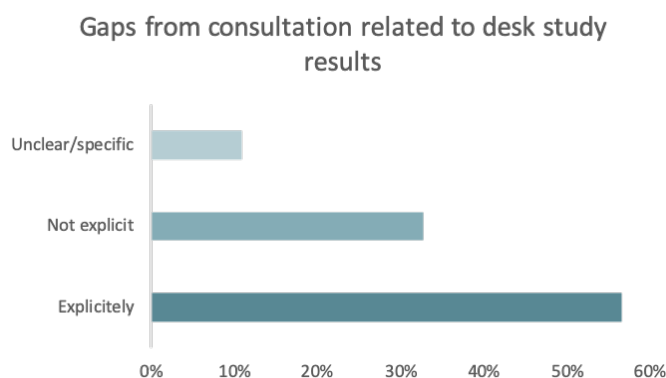
Most recurrent gaps collected [relate to awareness and capacity building \(31%\)](#), [the role of biodiversity in the provision of ecosystem services and NBS benefits \(28%\)](#) and to [the effectiveness of NBS across socio-ecological contexts \(14%\)](#). Finally, close to 10% of gaps collected relate to cost and benefits evaluation of NBS and on the need for planning and policy framework for NBS.

Interestingly, respondents perceive that most gaps as relating to the design stage of NBS (33% of gaps submitted) and the maintenance/management stage of NBS (20% of gaps submitted).

**Table 3.** Broad topics of knowledge gaps collected in the online

Nature of gaps	Broad topics of gaps	%
NBS Technical Design	Relationship between biodiversity, ecosystem functions and ecosystem services	14%
	Biodiversity benefits	14%
	Synergies and trade-offs between goals	7%
	Direct and indirect benefits for climate mitigation	7%
	Social cohesion and environmental justice	3%
	Performance and characteristics of plants	3%
NBS Evaluation	Effectiveness across socio-ecological contexts	14%
	Cost/benefit evaluations	10%
	Effectiveness at different time scales	3%
	Effectiveness at different geographical scales	3%
NBS Capacity Building	Awareness and Capacity Building	31%
	Knowledge Base	3%
NBS Governance	Planning and policy Framework	10%
	Stakeholder engagement	7%

An internal comparison of gaps submitted by respondents of the online consultation to those collected through the desk study also showed that while a majority of consultation gaps are explicitly identified in those collected in the desk study (close to 60%, see **Figure 4**), a number of these were not explicitly referred to (33%), e.g. relating to missing knowledge on the role of biodiversity in ecosystem services provision, implementation gaps related to the transposition of NBS in legislative frameworks, and capacity/awareness gaps related to awareness of NBS and acceptance by citizens. This can be explained due to the type of documents studied (i.e. research and research policy documents mainly), the scale of the gaps reported through the consultation (e.g. too specific gaps to be cited as such in EU synthesis literature on NBS) and possibly on some occasions because these have not been considered so far, although this would have to be explored in more detail to be able to ascertain.



**Figure 3.** Percentage of gaps collected via the consultation that relates to those identified in the desk study, either explicitly, not explicitly, or in an unclear/unspecific way.

### 3. Collaborative session results

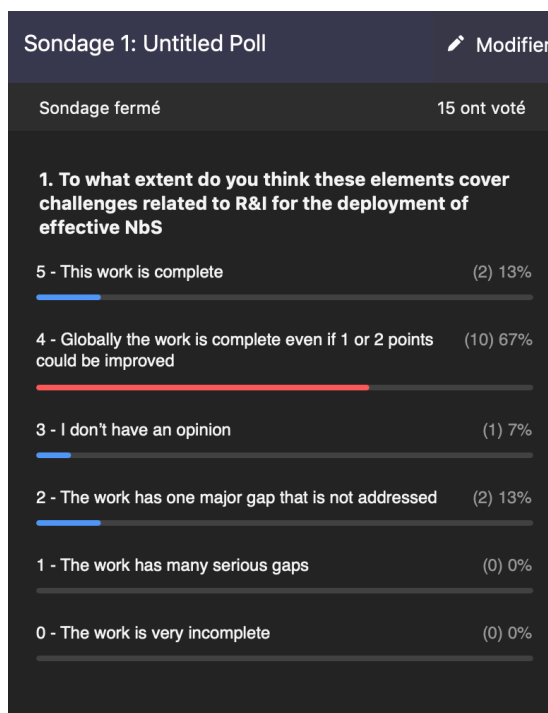
In the collaborative session, participants were presented with initial results from the mapping, and knowledge gaps work of NetworkNature towards the development of the EU roadmap for R&I on NBS. They overall, expressed a positive appreciation of the work done, as presented in **figure 5**.

In addition, participants had the opportunity to discuss in sub groups and then in plenary around the main facilitating factors for R&I to support the deployment of effective NBS, resulting as follows:

- General recognition of good momentum for promoting NBS, with a growing public awareness of biodiversity loss, which is also considered to be higher on policy agenda today that a few years ago.
- The EU policy in place, in particular related to efforts of the European Commission to support the theme, were identified as a strong positive facilitating factor.
- Relying more on citizens' involvement, through social awareness and empowerment, was also identified as a decisive facilitating factor for the deployment of NBS in general.

In addition, participants were invited to expose and rank in order of priority the main barriers they identified for R&I to support the deployment of NBS. Full results are available in **Annex 4**, however, the ranking of main barriers allowed identifying:

- Issues related to the lack of knowledge on NBS benefits, which echoes results from the two other streams of work
- Issues related to siloed approaches in knowledge, policy and practice, and the presence of dominant narratives related to e.g. engineering.
- The lack of systemic indicators and barriers related to access to data and governance.



**Figure 4:** Results of the online poll on work presented during the NetworkNature annual event 2021

## 4. Next Steps

This research gap analysis will be used to feed into the re-development of the EU Roadmap for Research and Innovation on NBS (First Draft for May 2022 and final version in May 2023). The broad gap topics identified in this report will be further developed into:

- [A searchable knowledge gaps database](#), available on the NetworkNature web-platform. The database is backed by documented literature and citations identified as part of the desk study, together with results from the consultation and dialogue session.
- **Knowledge needs briefs**, developed as part of the NetworkNature project for dissemination to its different target audiences.

In addition, update and further contribution to this work are expected between second half of 2022 and first half of 2023, through the engagement of stakeholder dialogues and consultations based on the first draft of the EU roadmap for R&I on NBS.

## Annex 1: List of publication used in the desk study

- Cohen-Shacham, E., Andrade, A., Dalton, J., Dudley, N., Jones, M., Kumar, C., Maginnis, S., Maynard, S., Nelson, C.R., Renaud, F.G., Welling, R., Walters, G., 2019. “Core principles for successfully implementing and upscaling Nature-based Solutions”. *Environmental Science & Policy* 98, 20–29.
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- Dumitru, A., Frantzeskaki, N., Collier, M., 2020. “Identifying principles for the design of robust impact evaluation frameworks for nature-based solutions in cities”. *Environmental Science & Policy* 112, 107–116.
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- Hamel, P., Tan, L., 2021. “Blue-Green Infrastructure for Flood and Water Quality Management in Southeast Asia: Evidence and Knowledge Gaps”. *Environmental Management*.

- Kabisch, N., Frantzeskaki, N., Pauleit, S., Naumann, S., Davis, M., Artmann, M., Haase, D., Knapp, S., Korn, H., Stadler, J., Zaunberger, K., Bonn, A., 2016. "Nature-based solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action. *E&S* 21, art39.
- McQuaid, Siobhán, Rhodes, Mary-Lee, Andersson, Thomas, Croci, Edoardo, Feichtinger-Hofer, Marianne, Grosjean, Matthieu, Lueck, Alina, Kooijman, Esmee, Lucchitta, Benedetta, Rizzi, Daniela, Reil, Alice, Schante, Joanne, 2021. *From Nature-based Solutions to the Nature-based Economy - Delivering the Green Deal for Europe. Draft White Paper for consultation*. Nature-based Economy Working Group of EC Task Force III on Nature-based Solutions.
- Nelson, D.R., Bledsoe, B.P., Ferreira, S., Nibbelink, N.P., 2020. Challenges to realizing the potential of nature-based solutions. *Current Opinion in Environmental Sustainability* 45, 49–55.
- Raymond, C.M., Centre for Ecology and Hydrology (Great Britain), 2017. *An impact evaluation framework to support planning and evaluation of nature-based solutions projects: prepared by the EKLIPSE Expert Working Group on nature-based solutions to promote climate resilience in urban areas*.
- Ruangpan, L., Vojinovic, Z., Di Sabatino, S., Leo, L.S., Capobianco, V., Oen, A.M.P., McClain, M.E., Lopez-Gunn, E., 2020. Nature-based solutions for hydro-meteorological risk reduction: a state-of-the-art review of the research area. *Natural Hazards and Earth System Sciences* 20, 243–270.
- Seddon, N., Chausson, A., Berry, P., Girardin, C.A.J., Smith, A., Turner, B., 2020. Understanding the value and limits of nature-based solutions to climate change and other global challenges. *Philosophical Transactions of the Royal Society B* 375
- Somarakis, G., Stagakis, S., Chrysoulakis, N., n.d. *ThinkNature / Nature-Based Solutions Handbook*.
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## Annex 2: Societal Challenge Typology

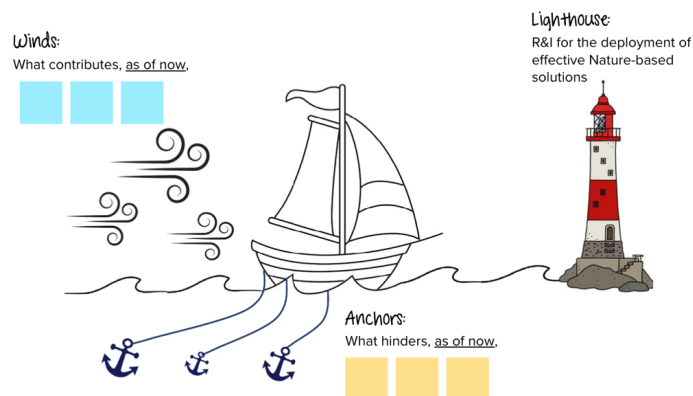
IUCN Societal Challenge Typology <u>Cohen-Schacham et al.</u> <sup>1</sup>	EC Societal Challenge <u>European Commission, Directorate General for Research and Innovation</u> <sup>2</sup>	Derived for NetworkNature mapping
Climate Change	Climate Resilience	<b>Climate Resilience</b>
Water security	Water Management	<b>Water Management</b>
Food security	-	<b>Food security</b>
Economic and Social Development	Social Justice and Social Cohesion	<b>Social Justice and Social Cohesion, New Economic Opportunities &amp; Green Jobs and Participatory Planning and Governance</b>
	New Economic Opportunities and Green Jobs	
	Participatory Planning and Governance	
Disaster Risk reduction	Natural and Climate Hazards	<b>Natural and Climate Hazards</b>
Human Health and well-being	Health and well-being	<b>Health, Well-being &amp; Air Quality</b>
	Air Quality	
-	Green Space Management	<b>Green Space Management, Place Regeneration &amp; Knowledge, and Social Capacity Building for Sustainable Urban Transformation</b>
	Place Regeneration:	
	Knowledge, and Social Capacity Building for Sustainable Urban Transformation	
-	Biodiversity Enhancement	<b>Biodiversity Enhancement*</b>

<sup>1</sup> Cohen-Schacham, E., Walters, G., Janzen, C. and Maginnis, S. (eds.) 2016. *Nature-based Solutions to address global societal challenges*.

<sup>2</sup> European Commission, Directorate-General for Research and Innovation, 2021. *Evaluating the impact of Nature-based Solutions: a handbook for practitioners*.

## Annex 3: detailed results of the dialogue session on knowledge gaps during the NetworkNature annual event 2021.

**What are the levers and brakes for R&I to accelerate/facilitate the deployment of effective Nature-based solutions ?**



**Winds:**  
What contributes, as of now,

Biodiversity crisis is coming up the policy agenda	Empowerment of youth	Open data	Funding opportunities	Social awareness	EU policy in place
Biodiversity crisis	Momentum at the policy level	Tendency for naturalness (biodiversity, plant ...)	Momentum for NBS many people interested	Creating a shared vision and inspiring action	
Growing awareness on biodiversity loss					

**Anchors:**  
What hinders, as of now,

Misuse of the NbS term: 'Green washing'	Dominance of certain narratives (e.g. engineering)	Systemic evaluation indicators missing - Lack of recognition of importance of open data on governance	people do not necessarily want more green areas in urban space - lack of social awareness	Lack of and little funding opportunities	poor political agenda
Lack of space for NbS (particularly in urban situations)	Lack of trust/confidence	Scaling up/down (from pilot to mainstream; from global to local; from local to global)	Lack of knowledge about the benefits of NBS	Lack of funding	Siloed approaches





# Network Nature



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